

Sweetwater Restoration Project

Restoration Planting Plan

River Partners has developed a site-specific planting design that represents a synthesis of the available information on the site conditions, project objectives, and recommendations from various partners. This project aims to enhance and restore approximately 500 acres of agricultural land into native habitat (*Figure 1*). The restoration plan focuses on transitioning the existing croplands into a diverse mix of native plant communities. Six different plant communities are planned with variations planned within each community, and the species diversity for each is outlined in Table 1 through Table 6 .

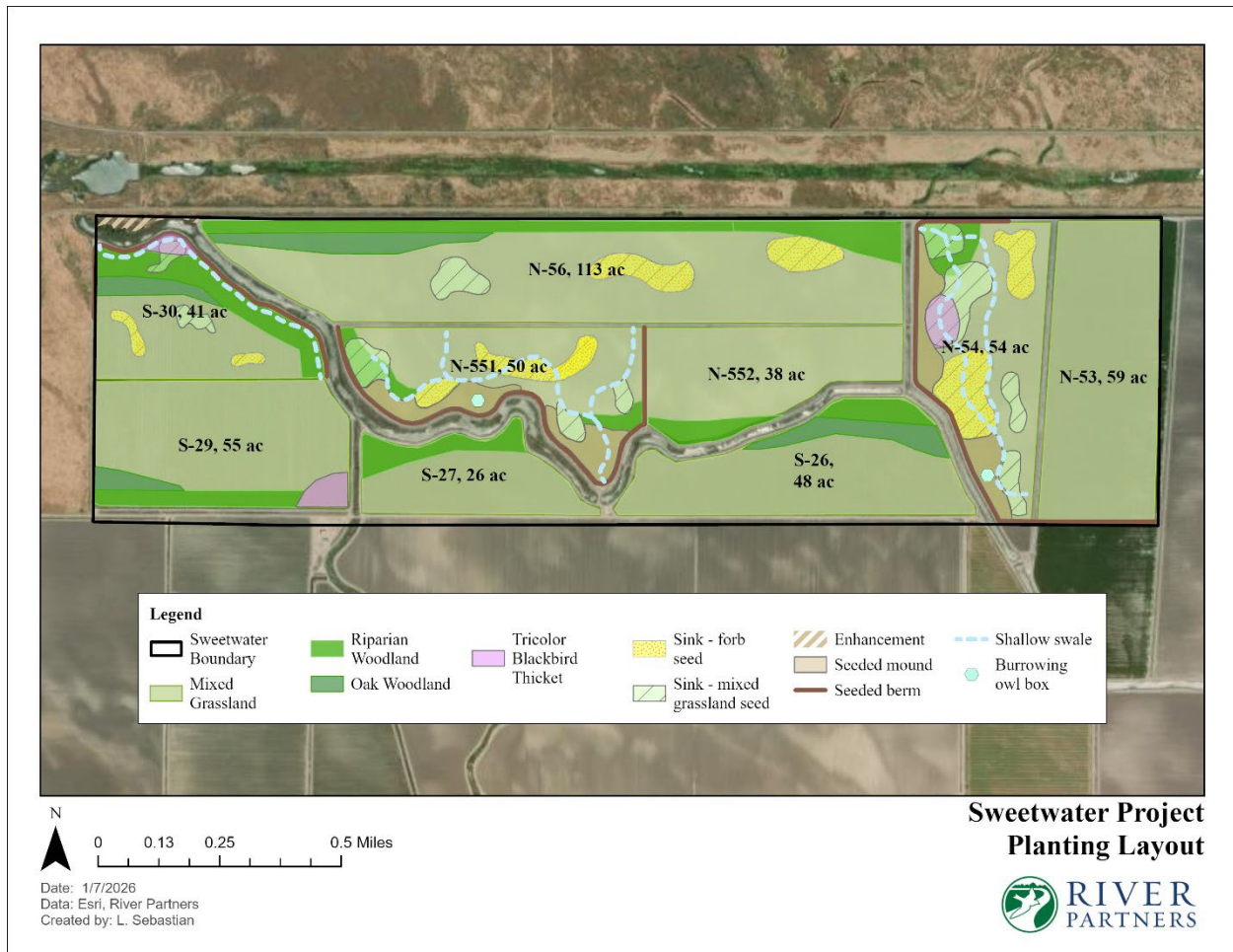


Figure 1. Sweetwater plant community layout map.

1. Mixed Grassland (460 acres)

Although Sweetwater may have historically supported tule marsh, this area is now mostly suitable for restoration to a mixed grassland after substantial water diversions and disconnection from natural floodplain inundation. These grasslands, once established, will persist on rainwater and seasonally high groundwater, and are adapted to dry Mediterranean summers. The grassland areas will include CNPS alliances from the two grassland cover types found in the area: California Vernal Pool and Grassland Matrix (VPG) and California Mixed Annual/Perennial Freshwater Vernal Pool/Swale Bottomland (VPB).

Specific CNPS alliances in this community type include creeping wildrye turf, alkali sacaton wet meadow, alkali weed - salt grass playas and sinks, fiddleneck-phacelia fields, and California goldfields - dwarf plantain - small fescue flower fields. Communities will primarily be seeded in rows of grasses alternating with rows of forbs. This allows for the selective weed management of grasses and forbs as they initially establish. A low density of native shrubs and trees seeded or planted into the grassland areas will provide additional structural diversity across the site. For example, oaks and willows will be planted along some of the low swales within the grassland seeding areas. Potential species in this community are listed in Table 12. Exact seeding ratios and mixes will be determined based on seed availability at the time of seed purchasing. The 460 acres listed includes the riparian woodland, seeded berm and mound areas and most of the newly excavated sinks, as all of those areas will include a grassland understory seeding treatment similar or identical to the other grassland areas.

Table 1. Mixed grassland species

Common Name	Latin name
Forbs & Grasses	
Creeping wild rye	<i>Elymus triticoides</i>
Alkali sacaton	<i>Sporobolus airoides</i>
Salt Grass	<i>Distichlis spicata</i>
Three-week fescue	<i>Festuca microstachys</i>
Annual hairgrass	<i>Deschampsia danthonoides</i>
Alkali barley	<i>Hordeum depressum</i>
Nodding needle grass	<i>Stipa cernua</i>
Forbs	
Mugwort	<i>Artemisia douglasiana</i>
Gumplant	<i>Grindelia camporum</i>
Alkali heath	<i>Frankenia salina</i>
Alkali heliotrope	<i>Heliotropium curassavicum</i>
Narrowleaf milkweed	<i>Asclepias fascicularis</i>
Alkali mallow	<i>Malvella leprosa</i>
Annual lupine	<i>Lupinus bicolor</i>
Western goldenrod	<i>Euthamia occidentalis</i>
Telegraph weed	<i>Heterotheca grandiflora</i>
Common fiddleneck	<i>Amsinkia menziesii</i>
Phacelia	<i>Phacelia tanacetifolia/ciliata</i>
Turkey tangle fogfruit	<i>Phyla nodiflora</i>
Goldfields	<i>Lasthenia californica</i>
Tidytops	<i>Layia platyglossa</i>
Redmaids	<i>Calandrinia menziesii</i>
Evening primrose	<i>Oenothera elata ssp. hirsutissima</i>
Yarrow	<i>Achillea millefolium</i>
Trees & Shrubs (low density)	
Iodine Bush	<i>Allenrolfea occidentalis</i>
Alkali goldenbush	<i>Isocoma Acradenia</i>

Valley oak	<i>Quercus lobata</i>
Black willow	<i>Salix gooddingii</i>
Quail Bush	<i>Atriplex lentiformis</i>

2. Goodding’s Black Willow Riparian Woodland (56 acres)

The Goodding’s Black Willow Riparian Woodland association would typically grow directly in and along Mariposa Slough. However, such planting may cause management challenges for Turner Island Water District (TIWD) and such planting has not yet been approved within their easement. The final placement and extent of this community could expand if TIWD approves the planting of woody riparian species in or near the Mariposa Slough or other irrigation canals. The association includes a diverse mix of tree and shrub species and will be planted at a density of roughly 227 plants/acre on approximately 56 acres in lower-lying areas of the project site. Sites with lower elevations along existing irrigation canals were selected to increase the chances of the riparian communities connecting to and persisting on the high groundwater table or available agricultural drainage water. This planting is also intended to provide a diversity of canopy and community structure at the site to create a covered wildlife corridor and nesting habitat for riparian birds. Table 2 lists the plants included in the Goodding’s Black Willow Riparian Woodland association, with a focus on species with moderate saline tolerance due to the intrinsic characteristics of the soil layers underlying it.

Table 2. Goodding’s black willow riparian woodland species

Common Name	Latin name	% Composition	Total Plants
Shrubs			
Blue-elderberry	<i>Sambucus nigra</i>	6%	341
Buttonbush	<i>Cephalanthus occidentalis</i>	6%	341
California blackberry	<i>Rubus ursinus</i>	12%	681
California rose	<i>Rosa californica</i>	10%	568
Coyote brush	<i>Baccharis pilularis</i>	2%	114
Sandbar willow	<i>Salix exigua</i>	2%	114
Quail Bush	<i>Atriplex lentiformis</i>	4%	227
Mule fat	<i>Baccharis salicifolia</i>	6%	341
Trees			
Arroyo willow	<i>Salix lasiolepis</i>	6%	341
Black willow	<i>Salix gooddingii</i>	16%	908
Box-elder	<i>Acer negundo</i>	6%	341
Fremont cottonwood	<i>Populus fremontii</i>	6%	341
Oregon ash	<i>Fraxinus latifolia</i>	4%	227
Valley oak	<i>Quercus lobata</i>	14%	795
	TOTAL:	100%	5675

3. Valley Oak Riparian Forest and Woodland (19 acres)

While the species found in the Valley Oak Woodland community are similar to the Goodding’s Black Willow Woodland community, this plant community is shift toward more drought a salt tolerant species, as they will be slightly further from the water table (Table 3). Fast-growing trees such as willows and cottonwoods provide immediate structure for vining plants and wildlife and are clustered away from Valley oaks in the planting tiles. This minimizes competition for light and allows the slow-growing oaks to make the most of the irrigated establishment phase. Once established, Valley oaks are highly tolerant of natural disturbance events, like drought and flooding, allowing them to persist as the planting area transitions to a late successional oak-dominated woodland. The dense presence of oak trees supports a unique type of riparian wildlife species that rely on their acorns, such as squirrels, woodpeckers, turkeys, yellow-billed magpies, and elk. This community is located at moderately high elevation points of the property, where the water table remains accessible to the deeply rooted native grasses and oaks.

Table 3. Valley Oak Riparian Forest and Woodland species

Common Name	Latin name	% Composition	Total Plants
Shrubs			
Blue-elderberry	<i>Sambucus nigra</i>	6%	259
California blackberry	<i>Rubus ursinus</i>	10%	431
California rose	<i>Rosa californica</i>	8%	345
Coyote brush	<i>Baccharis pilularis</i>	4%	173
Golden Currant	<i>Ribes aureum</i>	4%	173
Mule fat	<i>Baccharis salicifolia</i>	10%	431
Sandbar willow	<i>Salix exigua</i>	6%	259
Quail Bush	<i>Atriplex lentiformis</i>	8%	345
Trees			
Arroyo willow	<i>Salix lasiolepis</i>	2%	86
Black willow	<i>Salix gooddingii</i>	12%	518
Box-elder	<i>Acer negundo</i>	6%	259
Fremont cottonwood	<i>Populus fremontii</i>	4%	173
Oregon ash	<i>Fraxinus latifolia</i>	2%	86
Valley oak	<i>Quercus lobata</i>	18%	776
	TOTAL:	100%	4313

4. Alkali Playas and Sinks (45 acres)

To mimic nearby remnant grasslands and restore historic microtopography, shallow pools or sinks will be excavated in the leveled agricultural fields. Up to 45 acres of shallow depressions will be excavated, and a subset of those (roughly 25 acres) will be seeded with alkali playa and sink adapted species. The other sinks will be seeded along with the mixed grassland community in the surrounding areas, providing a test of various seeding strategies within these low areas. Although species composition depends upon specific inundation conditions and water chemistry, River Partners will seed a diverse mix of local flood-tolerant species, allowing the most suitable species to persist (Table 4). Some species, like alkali sacaton, will be

planted at the edges of sinks via plugs. Planting designs will aim to create a community that can persist on rainwater and groundwater.

Table 4. Alkali playa and sink species

Common Name	Latin name
Alkali sacaton	<i>Sporobolus airoides</i>
Salt Grass	<i>Distichlis spicata</i>
Alkali barley	<i>Hordeum depressum</i>
Baltic rush	<i>Juncus balticus</i>
Alkali heath	<i>Frankenia salina</i>
Alkali mallow	<i>Malvella leprosa</i>
Spike weed	<i>Centromadia pungens</i>
Goldfields	<i>Lasthenia californica / ferrisiae</i>
Tidytops	<i>Layia platyglossa / fremontii</i>
Meadowfoam	<i>Limnanthes alba</i>
Alkali heliotrope	<i>Heliotropium curassavicum</i>
Blow wives	<i>Achyrachaena mollis</i>
Iodine bush	<i>Allenrolfea occidentalis</i>
Bush seepweed	<i>Suaeda nigra</i>

5. Tricolor Blackbird Thicket (6 acres)

Historically, Tricolor blackbirds nested in large colonies in native wetlands dominated by cattail (*Typha latifolia*) and tule (*Schoenoplectus* spp.), as well as in dense thickets consisting of nettles (*Urtica* spp.), blackberry (*Rubus* spp.), and willows (*Salix* spp.) that provided essential nesting cover. This planting community is designed to replicate the structural characteristics of that historic habitat and is located adjacent to the water features on the property. While it is challenging to recreate the expansive wetlands at this site, this community represents an innovative approach to provide the dense, protective vegetation needed for nesting. Tricolors are expected to nest in the cattail and tule patches in Mariposa Slough, so these thickets are intended to supplement those nesting areas. The dense plantings (454 plants/ac) provide predator cover, and the thorns on plants like California rose and blackberry provide a mechanical defense (Table 5). Grasslands and nearby croplands will provide forage, such as insects and grains.

Table 5. Plant species diversity and planting density of the Tricolor Blackbird Thicket.

Common Name	Latin name	% Composition	Total Plants
California blackberry	<i>Rubus ursinus</i>	44%	1199
California rose	<i>Rosa californica</i>	44%	1199
Black willow	<i>Salix gooddingii</i>	6%	163
Blue elderberry	<i>Sambucus nigra</i>	6%	163
	TOTAL:	100%	2724

6. Seeded Mounds and Berms

The total length of elevated berms mapped around field edges on the planting layout draft is about 11,000 feet. With gently-sloping berms about 20 feet wide on average, berms will cover about 5 acres across the property. The slightly elevated mounds created from the excavated depressions cover roughly 16 acres. However, these areas will be seeded continuously with the other grassland seeding, so the acreages are listed in that category. In addition to the grassland seeding mix, this habitat will be planted with additional herbaceous and woody plugs that thrive in elevated locations in the landscape (Table 6). This habitat will provide additional dense cover, pollinator forage, and nesting habitat in an otherwise open area. Some areas of the berms will be seeded or planted with little to no vegetation to create open areas suitable to burrowing owl nesting preferences. Low lying species that will outcompete invasive plants but leave open sightlines for owls include salt grass (*Distichlis spicata*) and turkey tangle fogfruit (*Phyla nodiflora*).

Table 6. Seeded mound and berm species

Common Name	Latin name
Alkali sacaton	<i>Sporobolus airoides</i>
Salt Grass	<i>Distichlis spicata</i>
Narrowleaf milkweed	<i>Asclepias fascicularis</i>
Turkey tangle fogfruit	<i>Phyla nodiflora</i>
Alkali mallow	<i>Malvella leprosa</i>
Telegraph weed	<i>Heterotheca grandiflora</i>
Phacelia	<i>Phacelia tanacetifolia/ciliata</i>
Yarrow	<i>Achillea millefolium</i>
Blue-elderberry	<i>Sambucus nigra</i>
Coyote brush	<i>Baccharis pilularis</i>
Quail Bush	<i>Atriplex lentiformis</i>